NIVA

NEW IACS VISION IN ACTION

UC1b (Agro environmental indicators)

Dublin Conference

11th – 12th of May 2020

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 842009

UC1B new developments

- List of agroenvironmental indicators
- Carbon storage Tier I - Functional analysis
- Prototype development and testing (CS Tier I)
- Multi MS testing (Denmark Netherlands, Spain)

List of Agroenvironmental indicators scientific approach

List of Agro-Environmental Indicators

➢ We propose 11 A.E. indicators addressing 3 CAP objectives and 5 categories of environmental issues related to:

- **Climate mitigation**: C budget, reduction of N fertilisers
- **Water quality**: nitrates, pesticides, herbicides, fungicides
- **Biodiversity**: biodiv. conservation, biological control, pollination
- **Soils**: quality, erosion
- **Landscapes**: aesthetic value

➢ For each type of indicator we propose between 1 to 4 methods of calculations: from TIER 1 to 4. All of them are evidence-based, most of them published and several were adapted from the H2020 DiverImpacts project (scoring systems from 0 to 1),

➢ Five of them will be presented in details to illustrate the methodological approach and because we consider they are a priority.

Carbon budget Indicators

➢ Empirical approaches: plot level/annual

TIER 2

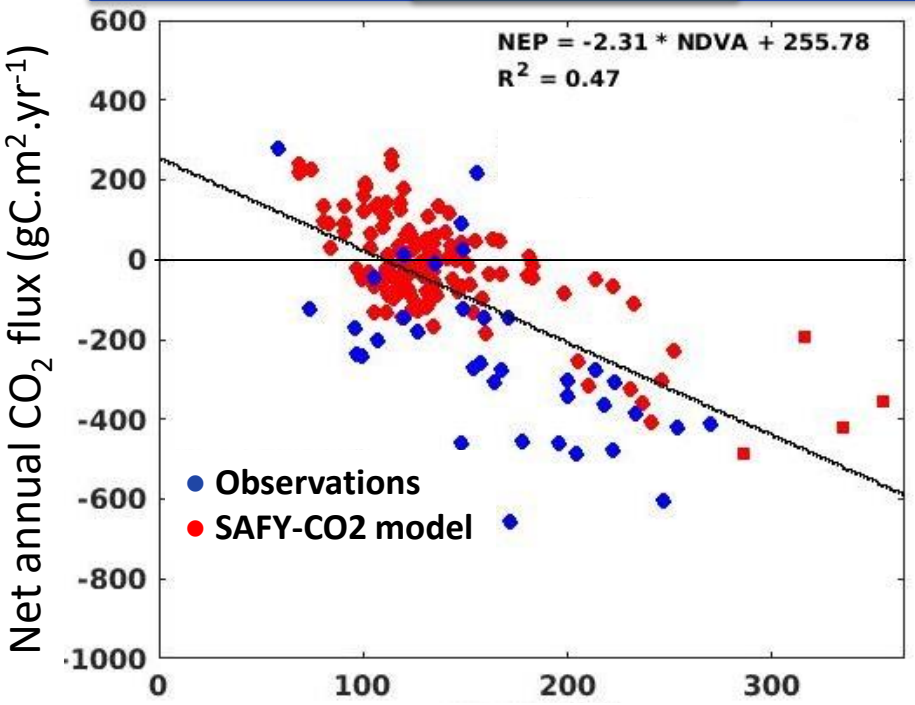
TIER 1

C budget = Net CO_2 flux + C harvested – Org. fertil.

Farmer's data (FMIS)

CO_2 release

CO_2 fixation



Ceschia et al. (2010), Pique et al. (minor revision)

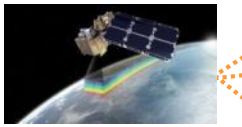
- What do we need to know from the farmers ?

- C harvested:
  - yield (grain t/ha)
  - eventually the amount of straw/cover crop exported (t/ha),

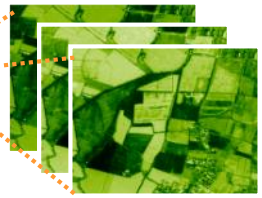
- Are organic amendments applied ? If yes:
  - type of amendment,
  - amount (t/ha).

Carbon budget Indicators

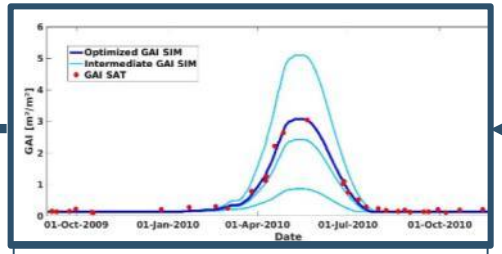
➢ TIER 3, modelling approach: SAFY-CO2



Sentinel 2



m^2 leaves/m^2 soil



Calibration of phenological & photosynthetic efficiency parameters

Crop maps

Crop param

SAFY-CO_2

(Veloso, 2014)
Pique et al. (in revision)

Leaf Area Index

Climatic data (e.g., ERA-5)

Rg,T°C

Biomass,
Yield,

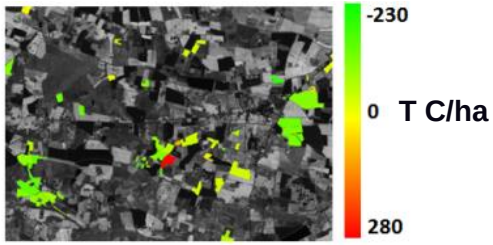
Validation with farmers & regional stat. for yield

International flux stations networks

ICOS INTEGRATED CARBON OBSERVATION SYSTEM

FLUXNET A Global Network

CO_2 fluxes
+
C budgets



FMIS

Straw export?
Organic Fertil ?

Nitrate leaching indicators

➢ Are calculated for **each couple previous/current cropping year** at plot level, but can be summed at rotation scale

➢ **2 TIERS**:

➢ **TIER 1:**

➢ Scoring method (beween 0 and 1)

Crop rotation

Previous crop

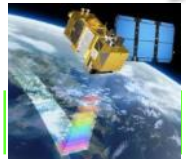
Catch crop

Crop

Presence of CC
Development intensity
F factor

Data needed

IACS data



Sentinel data 1 & 2

IACS data

Mineralisation
crop residue
soil after
previous crop (X2)

–

N uptake
Crop
Catch crop

➢ **TIER 2**:

➢ Weighting factor (beween 0 and 1)

Type of catch
Crop (FMIS)

Soil climate

External data
Weather-soil map

Biodiversity indicator

➢ Specificity

- Concerns the neighbouring area of each parcel

➢ 4 main components

- Crop diversity : Shannon index (IACS)
- Plot structure : average size of the parcels (IACS)
- Semi-natural elements - Lanscape features (IACS or Sentinel)
- Agricultural practices : tillage, fertilizers, Pesticides (FMIS)

➢ Still to be done

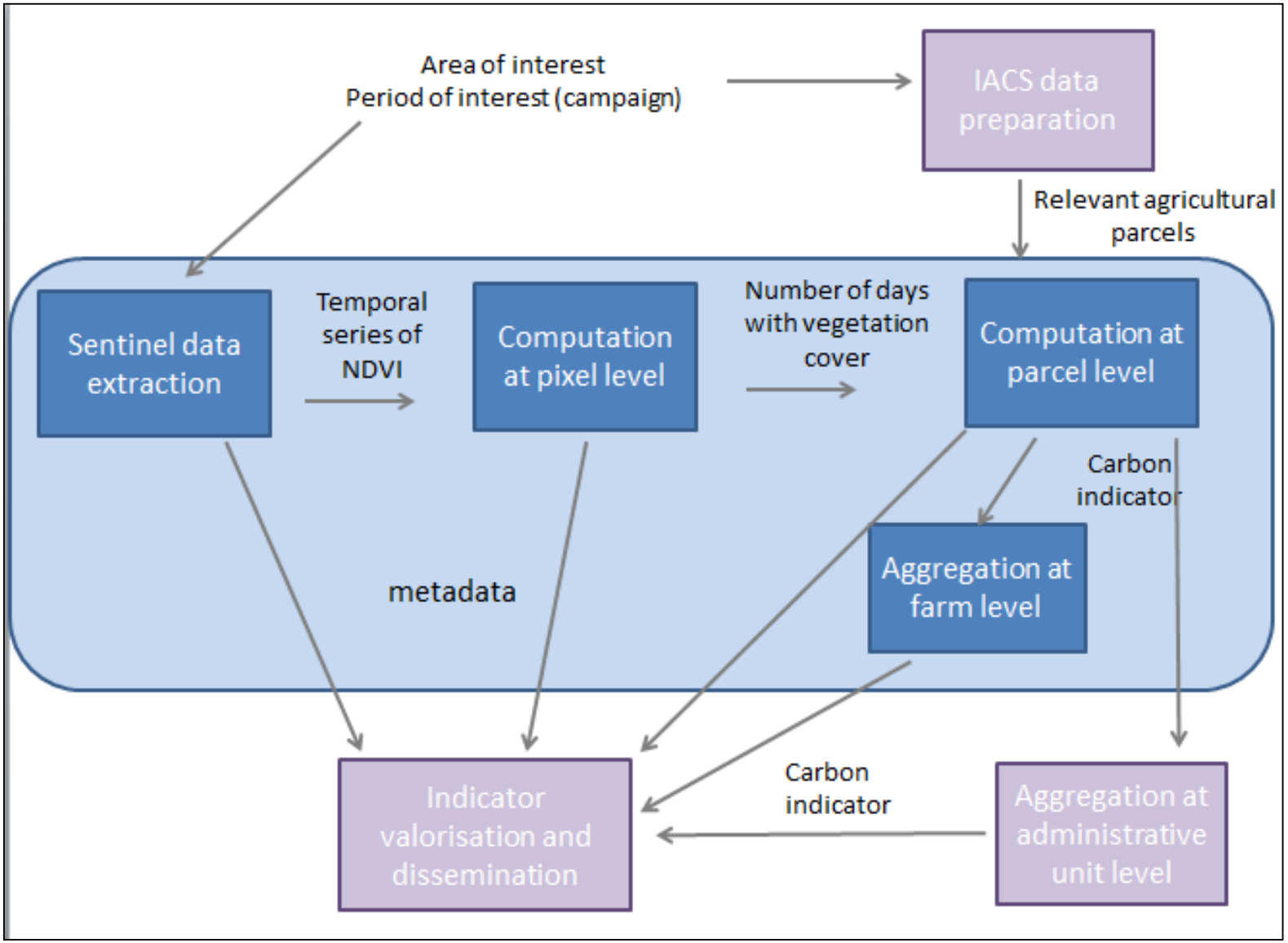
- Scope of the different tiers
- Allocation rules to each parcel
- Contribution rules of each parcel

Carbon budget indicator - Tier I

Functional analysis

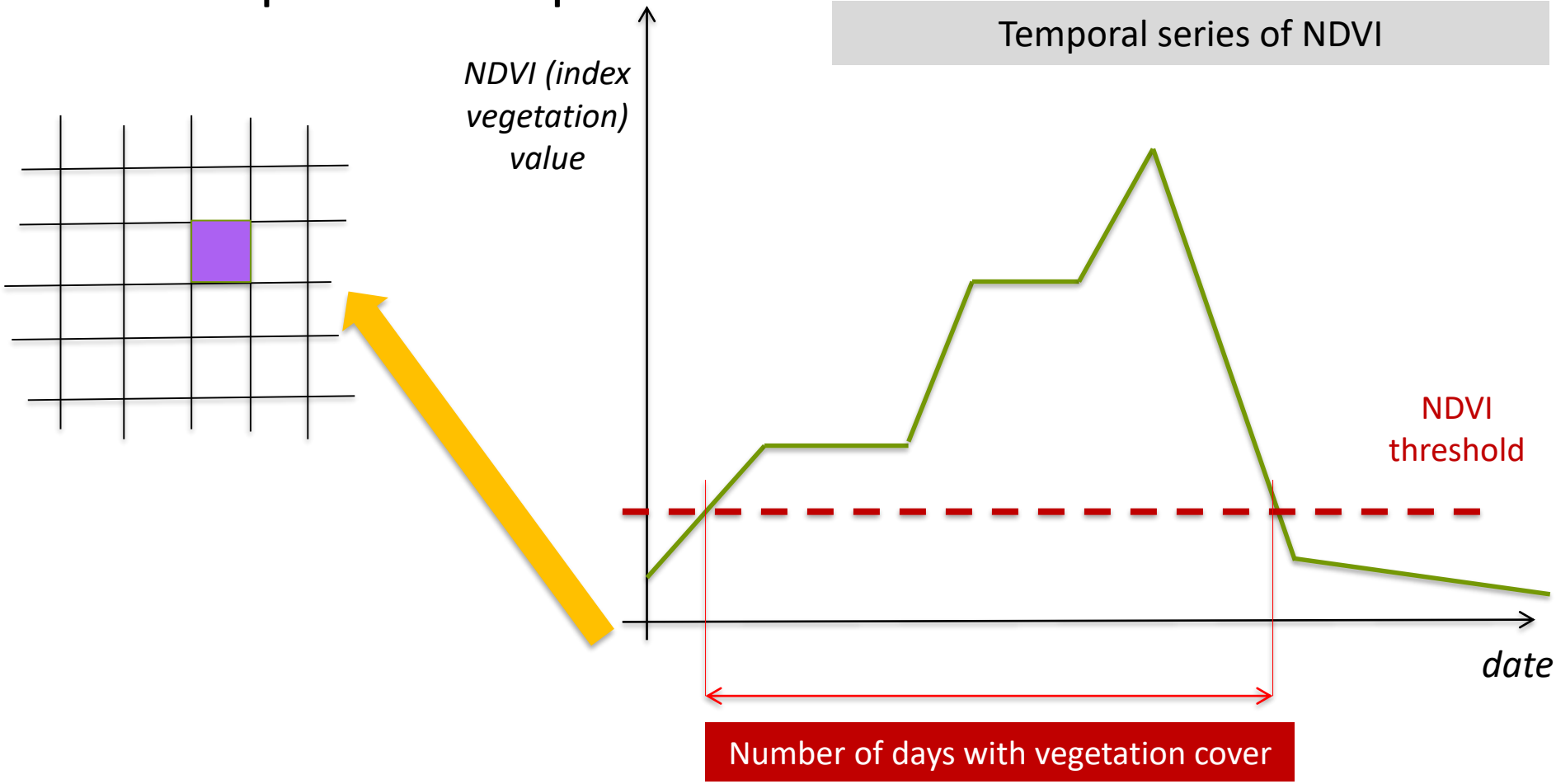
(Annex I of D2.2)

METHOD MAIN STEPS



MAIN STEPS

- Computation at pixel level



MAIN STEPS

- Computation at parcel level
  - Compute carbon indicator: y = ax + b

  - Aggregation phases à farm level or region level

Carbon budget indicator - Tier I

Prototype development and testing

PILOT PROTOTYPE FOR CARBON STORAGE TIER 1

- Based on Sen4Cap data structure
- Additional module with OrpheoToolBox (IGN in June)
- Crop list non exhaustive (with Lucas crop reference)

Common wheat (spring or winter) – (B11)
Durum wheat (spring or winter) – (B12)
Barley (spring or winter) – (B13)
Rye (B14), Oats (B15)
Maïze –(B16)
Triticale (B18)
Other Cereal (B19) - (sorghum, millet)

Potatoes (B21)
Sugar Beet (B22)
Fodder beet (B23a)
Sunflower (B31)
Rapeseed (B32)
Soya – (B33)
Peas – (B41)

OPTIONS TO ACCESS TO SENTINEL 2 DATA

- Use data already computed and sent by Sen4CAP

To secure our prototype development -> NDVI time series directly sent by Sen4CAP in our testing zone at pixel and parcel scale (France pilot MS in Sen4CAP)

- Download data from Sen4CAP

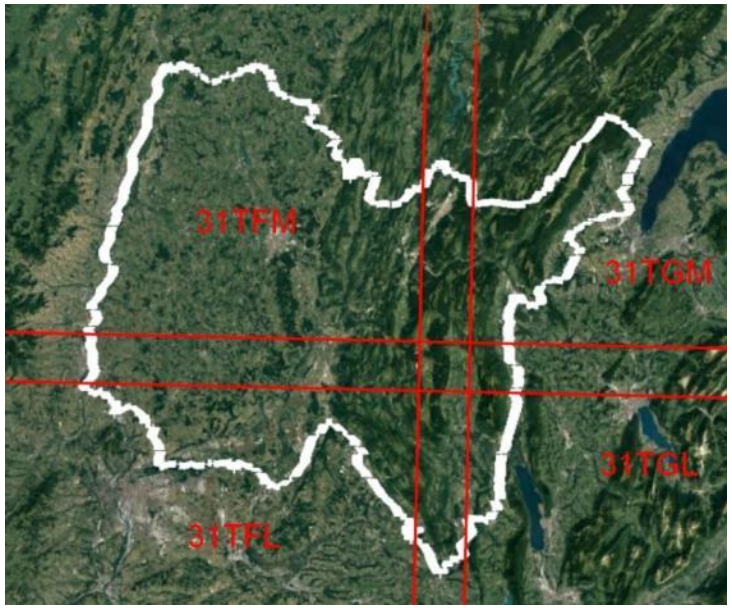
Especially biophysical indicators on vegetation status (L3A processor)

Main issue: significant time may be required to get familiar with Sen4CAP

TESTING ZONE : Ain Département

- Strong presence of cereal crop in Ain department are taken into account carbon storage method
  - Around 31 000 agricultural parcels
  - 123 000 ha
  - 12,3 million S2 pixels (100 sq m)
  - A large part of maize, wheat, barley, rapeseed, triticale, sorghum, sunflower…

- Sentinel 2 coverage
  - 4 tiles concerned (110x110 km)



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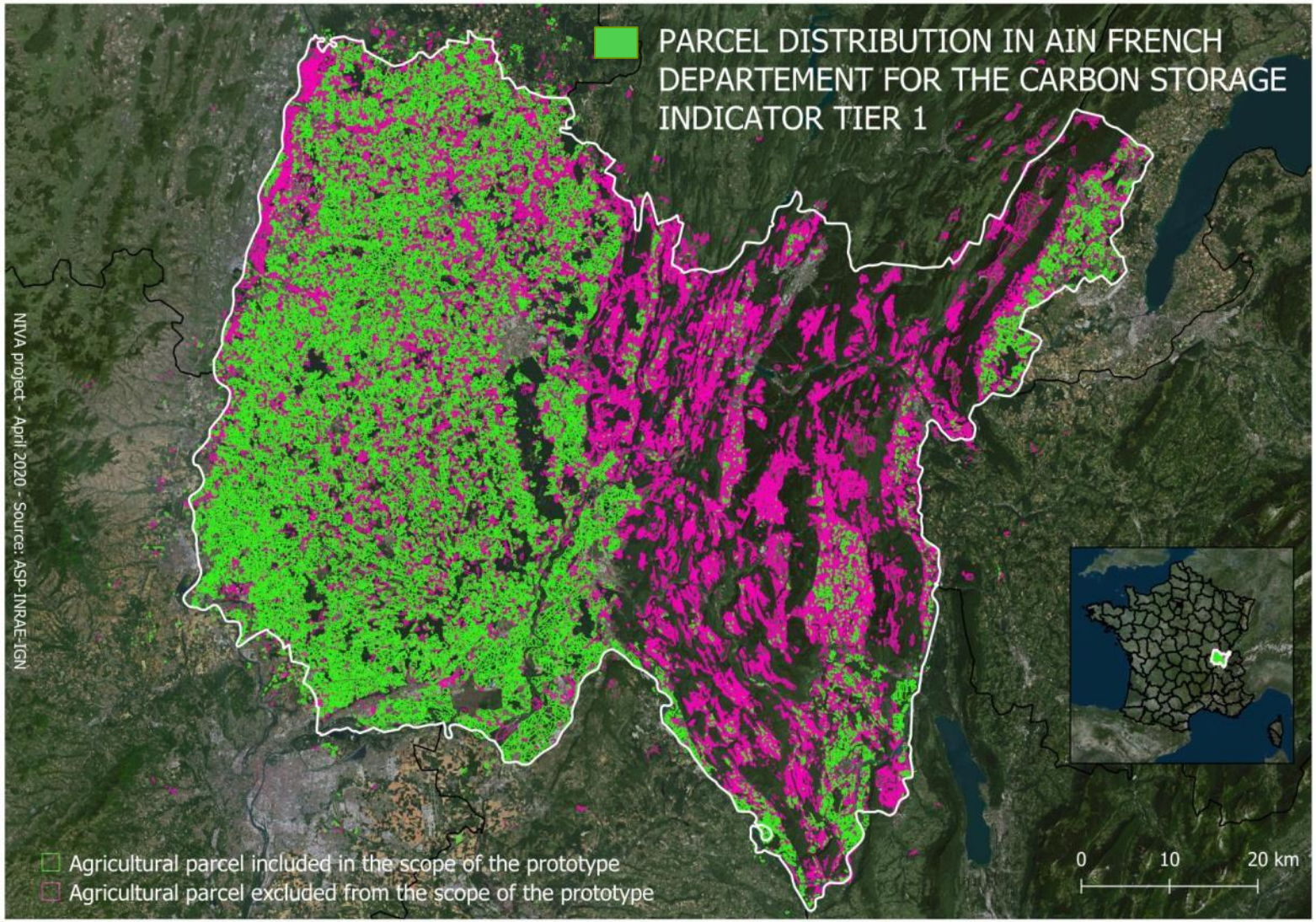

other crops : mainly permanent grasslands in Jura mountains

Carbon budget indicator - Tier I Multi MS Testing

NEXT STEPS

- Preparing the Multi MS Pilot Testing phase 1/2

  ➢ **Read our (living) documents** : annex I of D2.2 + data model

  - get overview of necessary input data and overall process
  - provide feed-back about feasibility or expected difficulties

  ➢ **Begin to think about testing conditions**

  - Testing scope: zone, crop list and period
  - Logistics and data availability (Sen4Cap + UC1b installation, IACS data)
  - Operate the prototype or wait for the pilot

NEXT STEPS

- Preparing the Multi MS Pilot Testing phase 2/2

  ➢ **Select areas in testing countries**

  - Identify the candidate crops for indicator calculation in testing areas.
  - Send the crop type lists to INRAE (Eric) in order to validate the crop selection
  - Take the opportunity to use the preliminary standard recommended by WP3 (LUCAS classification); contributing countries to make the matching

  ➢ **Operating the UC1b prototype and pilot**

  - Think about Sen4Cap software package installation (and additionnal UC1B modules / functionnalities that will be provided)